



# Institute for Materials Science

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## IMS Rapid Response 2016 \* Phase I Recipient Seminar



**Nan Li**

**MPA-CINT: Materials Physics & Applications Division -  
Center for Integrated Nanotechnologies  
Los Alamos National Laboratory**

### **Achieving High Mechanical Deformability in Piezoelectric AlN Nanocomposites**

**Monday, May 9, 2016**

**2:00 to 3:00pm**

**MSL Auditorium (TA-03 - Bldg 1698 - Room A103)**

**Abstract:** Piezoelectric ceramic films (such as AlN) have a wide range of applications in microelectronics. Under electric fields or mechanical strains, these materials can achieve energy conversion between mechanical work and electric power. Piezoelectric devices commonly experience cyclic mechanical and/or thermal loadings, and thus are often subject to sudden or fatigue cracking due to the poor room temperature plasticity and low fracture toughness associated with ceramic materials. The life of such components can consequently be prolonged through improved room temperature plasticity and fracture resistance. This project is seeking a novel approach of improving the mechanical performance of AlN by introducing a high density of tailored phase boundaries in the microstructure. Such an effect can be attributed to plastic co-deformation between the adjacent phases, phase transformation enhanced plasticity, and crack-tip shielding by plastic deformation. In this talk, I will present our recent *in situ* high resolution transmission electron microscope studies of exploring the unexpected reversible phase transformation behavior in AlN, and how mechanically control the reversible phase transformation will be highlighted.

**Bio:** Li earned a doctorate in materials science at Texas A&M University. Li joined Los Alamos to work with Amit Misra of MPA-CINT as a graduate research assistant and then as a postdoctoral researcher. He became a staff scientist in MPA-CINT in 2013. Through a combination of electron tomography and *in situ* transmission electron microscopy, Li aims to understand how atomic structures of interfaces contribute to the evolution of deformation-induced or radiation-induced defects and damage in advanced materials. He has been awarded TMS Best Graduate Student Paper Award, ACTA Student Award and the LANL Distinguished Postdoctoral Performance Award. In 2014, Li was granted a TMS Young Leader Professional Development Award.

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***Hosted by Alexander Balatsky \* Director of the Institute for Materials Science***